



**National University of
Science and Technology**
Think in Other Terms



**FACULTY OF COMMERCE
DEPARTMENT OF FINANCE
BACHELOR OF COMMERCE HONOURS DEGREE IN FINANCE
FINAL EXAMINATION – DECEMBER 2014
FINANCIAL ENGINEERING CFI 4106
TIME ALLOWED: 3 HOURS**

INSTRUCTIONS

- Answer Questions ONE & **ANY** other THREE questions
 - Each question carries 25 marks
-

INFORMATION FOR CANDIDATES

- The paper consists of 13 printed pages including cover page
- Businesses in this paper are fictitious

Question 1 [compulsory] – Write the letter which corresponds to the correct answer

(i). A financial contract that gives its owner the right, but not the obligation, to buy or sell a specified asset at an agreed-upon price on or before a given future date is called

a(n) _____ contract.

- a. option
- b. futures
- c. forward
- d. swap
- e. straddle

(ii). The act where an owner of an option buys or sells the underlying asset, as is his right, is called _____ the option.

- a. striking
- b. exercising
- c. opening
- d. splitting
- e. strangling

(iii). The fixed price in an option contract at which the owner can buy or sell the underlying asset is called the option's:

- a. opening price.
- b. intrinsic value.
- c. strike price.
- d. market price.
- e. time value.

(iv). The last day on which an owner of an option can elect to exercise is the _____ date.

- a. ex-payment
- b. ex-option

- c. opening
- d. expiration
- e. intrinsic

(v). An option that may be exercised at any time up its expiration date is called a(n) _____ option.

- a. futures
- b. Asian
- c. Bermudan
- d. European
- e. American

(vi). An option that may be exercised only on the expiration date is called a(n) _____ option.

- a. European
- b. American
- c. Bermudan
- d. futures
- e. Asian

(vii). A _____ is a derivative security that gives the owner the right, but not the obligation, to buy an asset at a fixed price for a specified period of time.

- a. futures contract
- b. call option
- c. put option
- d. swap
- e. forward contract

(vii). A _____ is a derivative security that gives the owner the right, but not the obligation, to sell an asset at a fixed price for a specified period of time.

- a. futures contract
- b. call option
- c. put option
- d. swap
- e. forward contract

(ix). A trading opportunity that offers a riskless profit is called a(n):

- a. put option.
- b. call option.
- c. market equilibrium.
- d. arbitrage.
- e. cross-hedge.

(x). The value of an option if it were to immediately expire, that is, its lower pricing bound, is called an option's _____ value.

- a. strike
- b. market
- c. volatility
- d. time
- e. intrinsic

(xi). The relationship between the prices of the underlying stock, a call option, a put option, and a riskless asset is referred to as the _____ relationship.

- a. put-call parity
- b. covered call
- c. protective put
- d. straddle
- e. strangle

(xii). The effect on an option's value of a small change in the value of the underlying asset is called the option:

- a. theta.
- b. vega.
- c. rho.
- d. delta.
- e. gamma.

(xiii). An option that grants the right, but not the obligation, to sell shares of the underlying asset on a particular date at a specified price is called:

- a. either an American or a European option.
- b. an American call.
- c. an American put.
- d. a European put.
- e. a European call.

(xiv). Which one of the following provides the option of selling a stock anytime during the option period at a specified price even if the market price of the stock declines to zero?

- a. American call
- b. European call
- c. American put
- d. European put
- e. either an American or a European put

(xv). Given an exercise price E , time to maturity T and European put-call parity, the present value of the strike price E plus the call option is equal to:

- a. the current market value of the stock.
- b. the present value of the stock minus a put option.
- c. a put option minus the market value of the share of stock.

- d. the value of a U.S. Treasury bill.
- e. the share of stock plus the put option.

(xvi). You can realize the same value as that derived from stock ownership if you:

- a. sell a put option and invest at the risk-free rate of return.
- b. buy a call option and write a put option on a stock and also lend out funds at the risk free rate.
- c. sell a put and buy a call on a stock as well as invest at the risk-free rate of return.
- d. lend out funds at the risk-free rate of return and sell a put option on the stock.
- e. borrow funds at the risk-free rate of return and invest the proceeds in equivalent amounts of put and call options.

(xvii). Which one of the following statements correctly describes your situation as the owner of an American call option?

- a. You are obligated to buy at a set price at any time up to and including the expiration date.
- b. You have the right to sell at a set price at any time up to and including the expiration date.
- c. You have the right to buy at a set price only on the expiration date.
- d. You are obligated to sell at a set price if the option is exercised.
- e. You have the right to buy at a set price at any time up to and including the expiration date.

(xviii). Jeff opted to exercise his August option on August 10 and received \$2,500 in exchange for his shares. Jeff must have owned a (an):

- a. warrant.
- b. American call.
- c. American put.
- d. European call.
- e. European put.

(xix). Jillian owns an option which gives her the right to purchase shares of WAN stock at a price of \$20 a share. Currently, WAN stock is selling for \$24.50. Jillian would like to profit on this stock but is not permitted to exercise her option for another two weeks.

Which of the following statements apply to this situation?

- I. Jillian must own a European call option.
 - II. Jillian must own an American put option.
 - III. Jillian should sell her option today if she feels the price of WAN stock will decline significantly over the next two weeks.
 - IV. Jillian cannot profit today from the price increase in WAN stock.
- a. I and III only
 - b. II and IV only
 - c. I and IV only
 - d. II and III only
 - e. I, III, and IV only

(xx). The difference between an American call and a European call is that the American call:

- a. has a fixed exercise price while the European exercise price can vary within a small range.
- b. is a right to buy while a European call is an obligation to buy.
- c. has an expiration date while the European call does not.
- d. is written on 100 shares of the underlying security while the European call covers 1,000 shares.
- e. can be exercised at any time up to the expiration date while the European call can only.

(xxi). If a call has a positive intrinsic value at expiration the call is said to be:

- a. funded.
- b. unfunded.

- c. at the money.
- d. in the money.
- e. out of the money.

(xxii). A 35 put option on ABC stock expires today. The current price of ABC stock is \$36. The put is:

- a. funded.
- b. unfunded.
- c. at the money.
- d. in the money.
- e. out of the money.

(xxiii). The maximum value of a call option is equal to:

- a. the strike price minus the initial cost of the option.
- b. the exercise price plus the price of the underlying stock.
- c. the strike price.
- d. the price of the underlying stock.
- e. the purchase price.

(xxiv). The lower bound on a call's value is either the:

- a. strike price or zero, whichever is greater.
- b. stock price minus the exercise price or zero, whichever is greater.
- c. strike price or the stock price, whichever is lower.
- d. strike price or zero, whichever is lower.
- e. stock price minus the exercise price or zero, whichever is lower.

(xxv). The lower bound of a call option:

- a. can be a negative value regardless of the stock or exercise prices.
- b. can be a negative value but only when the exercise price exceeds the stock price.
- c. can be a negative value but only when the stock price exceeds the exercise price.

- d. must be greater than zero.
- e. can be equal to zero.

Question 2

[Total :25marks]

(a) An investor is interested in a call option of ABC stock. The market is however currently trading 'thinly' on call options. It has therefore been difficult to get call options on ABC stock. The ABC stock, put options, forward contracts and futures contracts on the ABC stock are readily available in the market.

You are given that the current market price of the stock is 4000cents, 1-month 3900- strike put options are available for 143.80cents while forward contracts are at a 1-month forward price of 4120cents.

- i. Design a product that will satisfy the cash flow needs of the investor **[5marks]**
- ii. Use a pay-off table to show the performance of the product designed in (i) above and hence deduce the implied cost of the call option which the investor desires. **[5marks]**

(b) You have been following the investment actions of investor XYZ. You gather information showing that XYZ recently took a long position in Stock A, took a long position in a put option on the same stock while simultaneously taking a short position on a call option on the same stock.

- i. What could be the motivation of this strategy? **[4marks]**
- ii. Identify and explain the role and nature of the primary position(s) and secondary positions in this trading strategy. **[6marks]**

(c) Two traders A and B both use volatility option trading strategies primarily because they specialize in predicting the magnitude of volatility and not the direction of volatility. Trader A marvels the returns of a long straddle while trader

B prefers a long strangle. What arguments will you use to support trader A or trader B. **[5marks]**

Question 3

[Total: 25marks]

(a) You are hired by a financial company in Zambia and you have instant access to markets. You would like to lock in a 3-month borrowing cost in kwacha for your client. You consider a Kwacha 1x4 FRA. You however find that it is overpriced as the market is thin. So you turn to South Africa. ZAR FRAs are very liquid . It turns out that the ZAR & Kwacha forwards are also easily available. In particular you obtain the following data from Reuters:

ZAR/Kwacha Spot	1.17 / 1.18
1-month forward	1.17 / 1.22
3-month forward	1.19 / 1.23
4-month forward	1.28 / 1.32
ZAR FRAs 1x4	8.97

i. Show how you can create a Kwacha 1x4 FRA from data given **[6marks]**

ii. Show the cash flows of your FRA in (i) above. **[4marks]**

iii. Explain three risks of your position compared to a direct Kwacha FRA.

[6marks]

(d) Given that a call option has an exercise price of \$100. At the final exercise date, the stock price could either be \$50 or \$150. For some reason, the stock itself is not readily available in the market despite the fact that call options on this stock are available. Design a product that will produce the same cash flows as the stock over a period equal to the call option. **[4marks]**

(e) Analyse a long call position on an asset at strike price K and time t=T and a short put position on the same asset at same strike price K for an equal time T=t. If you enter into a forward contract today, you need to have the present value of the forward price F_T , so that you are guaranteed of performance at t=T.

Using these arguments on portfolios created at t=0, derive the Put- Call Parity relationship from calls, puts and a forward contract hence show that

$$C + Ke^{-rt} = P + S_0$$

Where;

C =Call price; P=Put price; K=Exercise price; S_0 = Spot price;

r= risk free rate of return & t= time to maturity for both put and call options

[5marks]

Question 4

[Total: 25marks]

(a) Alpha and Beta can borrow at the following rates.

	ALPHA	BETA
Credit rating	Aa	Baa
Fixed rate	10.5%	12%
Floating rate	MLR	MLR+1%

The two companies are seeking to borrow \$100,000 over a period of 3 years. Alpha prefers a floating rate borrowing while Beta prefers a fixed rate borrowing. Prepare a report to advise and convince the financial directors of the two companies on how they can combine their efforts and enjoy some cost savings. Assume that you will charge 0.4% for your services and the companies will share costs and benefits equally.

[9 marks]

- (b) Suppose Waldo's stock is currently priced at \$50. In the next six months it will either fall to \$40 or rise to \$60. The periodic six-month risk free rate is 2%, calculate
- the current value of a six-month call option with an exercise price of \$50 using the replicating portfolio approach. **[3marks]**
 - the current value of a six-month call option with an exercise price of \$50 Using the risk -neutral approach. **[3marks]**
- (c) Suppose you want to buy, at time $t=0$, a USD-denominated zero coupon, default free discount bond with a maturity at $t=1$. Assume that currency forwards are readily available on any other currency and that the relevant credit risks are the same.
- Show how you would use currency forwards and spot markets to design a product that replicates. **[2marks]**
 - Use the product above to price the USD zero coupon bond. **[3marks]**
- (d) Explain the basic mechanics of a credit default swap (CDS). **[5marks]**

Question 5

[Total: 25marks]

(a) Following the collapse of Hokkaido Takushoku Bank (HTB), the cost of raising money Eurodollar markets increased substantially for most Japanese banks. The Japanese Banks were now paying 40 basis points more than their United States counterparts compared to a premium of 30 basis points before the collapse of HTB. Faced with higher funding costs, Japanese Banks looked for alternative sources of finance. They started borrowing in Japanese Yen against the dollar in the spot market, they bought yen against dollars in the forward markets which in turn caused the USD/yen forward to rise dramatically.

Most investors were baffled by this as they did not understand what the Japanese were doing. With aid of clear diagrams and /or illustrations, explain the strategy of the Japanese. **[5marks]**

(b) Consider a \$40-strike call option written on 100 shares. Current spot price is \$40, risk free rate is 8%, volatility is 30% and no dividends paid. Assume that on day 2 and day 3 the stock was trading at \$40.50 and \$39.25 respectively.

- i. Show how the portfolio would look like if delta –hedged on day 1. **[3marks]**
- ii. Assuming dynamic delta hedging, show how the portfolios will look like for day 2 and day 3. **[5marks]**

(c) ABC Asset managers have a fully indexed, \$2 billion investment on the Zimbabwe Stock Exchange (ZSE). The investment is held for strategic reasons. The anticipated 3-year bearish trend on the ZSE has however caused some discomforts on ABC Asset managers who now want to reduce their exposure on the ZSE to \$1 billion. The high transaction costs and falling prices are however likely to make it difficult and costly to liquidate 50% of the portfolio. The fund managers want to diversify and buy into treasury bills which are expected to earn a floating rate of MLR + 0.5%.

- i. Suggest a strategy that can be used by the asset managers to diversify into treasury bills without incurring transaction costs and suffering the falling prices. **[3marks]**
- ii. If , in the next three years, the ZSE industrial index realizes returns of 6.5% , -10.5% and 23.5% annually while the MLR averaged 7.2%, 7.5% and 7.0% respectively for the three consecutive years. Evaluate your strategy in (i) above. **[4marks]**

(d) With aid of an example, show how securitization can be used by banks to regulatory capital requirements. **[5marks]**

END OF EXAMINATION PAPER